

**What is claimed is:**

1 1. A chemical-vapor deposition (CVD) gas injector having a gas inlet coupled to a  
2 gas source and adapted to supply gas from the source to a CVD system via at least one  
3 gas outlet in a manner that sufficiently maintains uniform supply of the gas in a zone of  
4 the CVD system that would exhibit a depleted gas supply absent the injector.

1 2. The injector of claim 1, wherein the injector is adapted to supply gas to a CVD  
2 system zone that exhibits an increased velocity of reactant gas in the zone due to a  
3 vacuum port in the CVD system.

1 3. The injector of claim 1, wherein the injector is adapted to increase the residence  
2 time of the supply gas at the CVD system zone.

1 4. The injector of claim 1, wherein the injector is adapted to provide a uniform  
2 pressure field of the supply gas in the CVD system.

1 5. The injector of claim 1, wherein the at least one gas outlet includes a plurality of  
2 outlets, and wherein the shape of each outlet is selected to sufficiently maintain the  
3 uniform supply of the gas.

1 6. The injector of claim 5, wherein at least two of the plurality of outlets have a  
2 different shape.

1     7.     The injector of claim 1, wherein the shape of at least one gas outlet is adjustable.

1     8.     The injector of claim 7, further comprising:

2           a gas concentration detector adapted to detect the concentration of gas in the

3     CVD system; and

4           an outlet shape adjustment device adapted to adjust the shape of the at least one

5     adjustable gas outlet in response to the gas concentration detector.

1     9.     The injector of claim 1, wherein the injector is adapted to supply gas including

2     at least one of: ammonia and dichlorosilane.

1     10.    The injector of claim 1, wherein the maintained uniform gas supply is selected

2     for CVD of a silicon nitride antireflective coating on a semiconductor wafer.

1     11.    The injector of claim 1, wherein at least a portion of the injector includes quartz.

1     12.    A chemical-vapor deposition (CVD) system adapted to deposit a coating on a

2     surface of at least one semiconductor wafer, the system comprising:

3           a gas source;

4           a CVD reaction chamber adapted to hold the die, to receive CVD reaction gasses

5     from the gas source and to generate conditions that cause the gasses to react and form

6     the wafer coating;

7           an exhaust pump coupled to the CVD reaction chamber and adapted to pump  
8 exhaust from the chamber; and  
9           a gas injector located in the reaction chamber and adapted to supply gas from the  
10 gas source to the surface of the at least one wafer at uniform supply and pressure during  
11 formation of the wafer coating.

1   13.    The system of claim 12, wherein the gas injector includes the injector of claim 1.

1   14.    The system of claim 12, wherein the exhaust pump causes gas to be drawn from  
2 the CVD reaction chamber in an uneven manner.

1   15.    The system of claim 14, wherein the gas injector is adapted to compensate for  
2 the exhaust pump.

1   16.    The system of claim 14, wherein the gas source is adapted to supply gas  
2 including ammonia to be used in the formation of a silicon-nitride anti-reflective  
3 coating on the wafer.

1   17.    The system of claim 12, wherein the injector outlets face a wall in the CVD  
2 reaction chamber.

1   18.    A system for forming a coating on a surface of a semiconductor wafer in a CVD  
2 ~~arrangement, the system comprising:~~

3 means for supplying a uniform supply of gas to the surface of the wafer, the  
4 surface being in a zone of the CVD arrangement that exhibits a depleted gas supply  
5 absent the injector; and  
6 means for using the supplied gas in combination with selected reactants to  
7 deposit a coating on the wafer.

1 19. A method for forming a coating on a surface of a semiconductor wafer in a CVD  
2 arrangement, the method comprising:  
3 supplying gas to the surface of the wafer using a gas injector adapted to maintain  
4 uniform supply of the gas in a zone of the CVD arrangement that would exhibit a  
5 depleted gas supply absent the injector; and  
6 using the supplied gas in combination with selected reactants and depositing a  
7 coating on the wafer.

1 20. The method of claim 19, wherein supplying gas to the surface includes  
2 supplying gas in different quantities to different zones of the CVD arrangement.

1 21. The method of claim 20, wherein the different quantities are selected to  
2 compensate for a gas depletion rate associated with the selected zone of the CVD  
3 arrangement to which the injector supplies gas.

1 22. The method of claim 19, wherein the gas includes at least one of: ammonia and  
2 dichlorosilane.

1 23. The method of claim 19, wherein depositing a coating on the wafer includes  
2 depositing an anti-reflective coating having uniform optical properties.

1 24. The method of claim 23, wherein the anti-reflective coating is deposited having  
2 a k value of refractive index that is between about 0.6 and 0.8.

1 25. The method of claim 23, further comprising performing photolithography on the  
2 wafer using the anti-reflective coating.

1 26. The method of claim 19, wherein depositing a coating on the wafer includes  
2 depositing a coating having uniform thickness.

1 27. The method of claim 19, further comprising adjusting the gas injector to  
2 maintain the uniform gas supply.

1 28. The method of claim 27, wherein adjusting the gas injector comprises:  
2 providing at least one gas concentration detector in the CVD arrangement;  
3 detecting the concentration of the supplied gas using the detector; and  
4 in response to the detected concentration, adjusting the gas injector.

1 29. The method of claim 28, prior to depositing a coating on the wafer, further  
2 comprising removing the at least one gas concentration detector from the CVD

3 arrangement after detecting the concentration of the supplied gas.

1 30. The method of claim 29, wherein detecting the concentration of the supplied gas  
2 using the detector includes operating the CVD arrangement under simulated processing  
3 conditions.